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THE I.C.I. MAGAZINE

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CONTENTS

FRONT COVER. *"Blackpool Illuminations," by John Brooks (Nobel Division).*

OUR CONTRIBUTORS

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Behind the Automation Scenes

By the Editor

Automatic control of chemical plants is no new development in I.C.I. It is something that has been gathering pace over the years. Behind it is a lot of painstaking research. Here the Editor takes you behind the scenes, talking with the scientists concerned, who explain what they are trying to do.

Photographs by Ivor Ashmore

SIR Alexander Fleck recently summed up the Company's policy on automation in the following words:

"If automation is taken to mean automatic control, then we have had automation to some degree ever since the Company was formed. As our processes and technical skills have developed, the degree of automation has increased. It has been a continuous development, still going on and increasing in pace, and a necessary one, which has enabled us to maintain and improve our position in the world's chemical industry."

It was with this statement in mind that I visited, one warm summer's day, the little village of Pangbourne beside the Thames. Here, on the foundation of work done by a small pioneering team over the last ten years, the Company has set up a laboratory to do fundamental research on the development of automatic process control.

I was surprised to find myself in a large red brick country house, once the home of a magnate of industry, now uninhabitable as such because of taxation. Here stables have become laboratories, the coach house has become a workshop, the outhouses instrument stores.

Presiding over the research activities was Mr. A. J. Young, a leading figure in the world of instrument technologists. He told me: "I.C.I. is already spending every year over £1½m. on instrumentation. Roughly half this sum goes toward buying the very expensive equipment, and the other half goes on design and maintenance and on constant search for improvement."

He paused before answering a question which he knew I would ask. "Why do we do this? *There is a simple answer: to produce a less expensive product. Instruments are the key to the efficient operation of a chemical process.* Their first job is to measure—measure such things as temperatures, pressures, levels and flow rates. The more accurate the measurements are, the higher the efficiency at which it is possible to keep the plant operating."

He went on, warming to his theme: "The very fact that so much information is being fed in through instruments has made it necessary to operate control through instruments as well. The process control job has become today just too big for an individual or a team of individuals to manage without automatic aids.

"There is another point, too. Many of the chemicals needed today, in particular by the plastics industry, are produced by highly complicated and closely integrated chemical processes. It would be quite impossible to carry out some of these processes on a large scale without automatic control."

Mr. Young went on to explain that part of the work at Pangbourne was to find out how to control existing processes even more efficiently. But the efforts of this unusual research group go a long way further than this. Its members are aiming to find out how to design plants in such a way that they respond more efficiently to automatic control. Instruments are already an integral part of all new chemical plant—not just an accessory added after design, as was the case twenty or thirty years ago. But the peak of this integration between instruments and plant design has not yet been reached; the objective at Pangbourne is to find out how to get to this peak as quickly as possible and by the shortest possible route.

Mr. Young led me out of the house to what was once the stables. Upstairs was a long, narrow room, formerly the loft, in the centre of which stood an aluminium rack. Here were mounted a number of imposing dials and recorders with leads and pipelines to other parts of the room. Three people were at work on the dials.

This was the instrument evaluation section. Into this room come the latest instruments, not merely from the leading British instrument makers but from all over the world, and in particular from America. It is here that these instruments are put through their paces to see if they match up to the claims of the makers and to I.C.I.'s requirements.

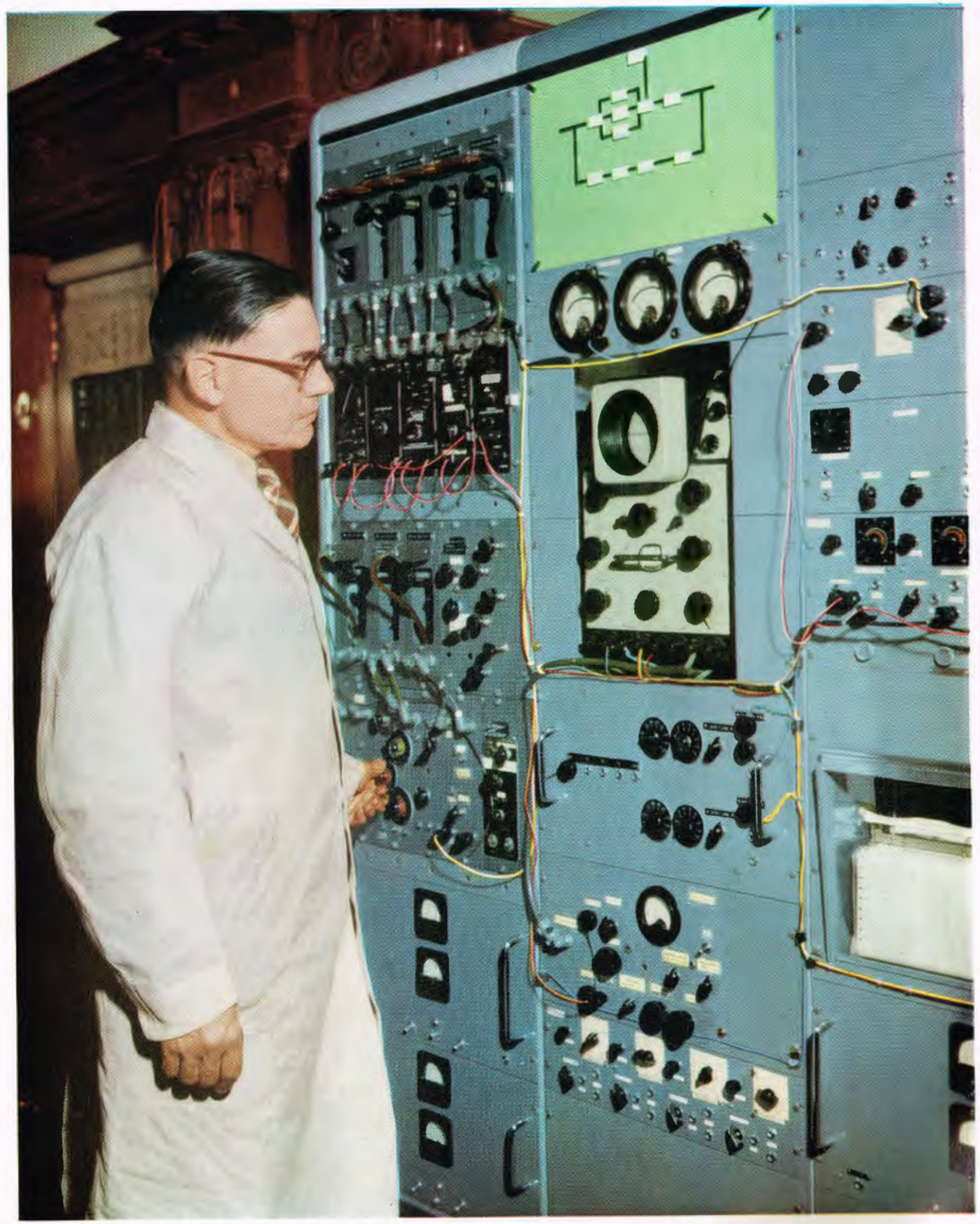
Tests on the Plant

After laboratory evaluation, new instruments are tested on the plant to see how they stand up to factory conditions. Mr. D. M. Bishop, the engineer with whom I talked, was, for example, returning with his expensive charges to Wilton in a few days' time for further trials of the equipment on which he was working. The equipment was an automatic controller. I asked him to tell me something about it.

"That one is full of electronics and is rather difficult to understand," said Mr. Bishop. "Let me explain first the principle of the pneumatic controllers. This form of controller is really the one that does the job today, and only now, after thirty years of good service and continuous development, is its position being challenged by the electronic type.

How Pneumatic Controllers Work

"Now," said Mr. Bishop, "you know that a finger laid over a pinhole in a punctured inner tube of a tyre will stop the air escaping and that if your finger is moved away from the puncture the air escapes more quickly as the finger gets further away. You can easily hear the hiss of escaping air increase. Of course, after a certain separation (which is actually very small) the air escapes at a rate which is no longer affected by movement of your finger. Exactly the same thing happens in the mechanism which is the basic part of all air-operated controllers. Air pressure can be used to position a large valve to control the steam rate, for example, so that as the flowmeter reading drops more steam is supplied and as the reading rises the steam rate is correspondingly reduced."



PANSI (*short for Plant ANalogue and SImulator*), *the Bozedown analogue computer, used for making models of relatively simple chemical plants. It is being operated by Mr. E. Penfold.*

Here Mr. Young broke into the conversation to explain the advantages of the electronic machine. "It's simply this," he said. "It takes time for a change in air pressure to be transmitted along the pipe from the controller to the valve it is controlling. This defect is one of the main arguments in favour of an electronic system. Moreover, an electronic system marries up readily with the electronic computer which, it is envisaged, will one day feed in instructions in a manner which will give much greater efficiency and may enable more complicated processes to operate than are commercially possible today."

I looked around the room, overawed at the complexity of the many automatic devices. How much did they cost? I asked Mr. Young. "About £10,000" he responded, and smiled as he saw my surprise.

100% *Reliability*

"It may sound a lot," he went on, "but you must remember this. A control instrument is built to give 100% reliability. There can be no other standard. A breakdown in the instrument can cost, overnight, thousands of pounds' worth of damage because the chemical reaction will go wrong, and perhaps a plant shutdown will become necessary. One simply cannot afford this, and therefore the best instruments are bought and the greatest care is taken in their maintenance. Of course, failure occurs sometimes. But complete avoidance of failure would mean duplication of control, and except in very special circumstances the expense is not justified, as the likelihood of failure, after all, is very small."

Fundamental Thinking

We moved on to visit another section. It was a bare barrack of a room with a concrete floor. It was almost empty except for an apparatus of glass columns and retorts in the middle.

"Semi-technical laboratory," said Mr. Young. "You will remember I said that in the early days instruments just grew on to existing processes. Well, this is the opposite approach. We are trying to learn more about the way in which processes respond to control so that we can design control systems in the light of first principles. What you see here is a small-scale distillation column which is being used by means of experiments to check and confirm calculations. Later these experiments will be repeated on a full-scale distillation column in one of the Divisions."

Mr. Young went on to initiate me. "We make a change in conditions, for example in column pressure," he said, "and measure the resulting change in other variables, such as the temperature in the column. If the changes are what we calculated, well and good. If not, we have to do some more work to find out where we were wrong. In this laboratory the problems of chemical reaction, plant design and control system design are treated as one. It is not a question of just designing a control system to provide a workable answer. We want to do more than that. *We want the process to run at highest economic efficiency.*

Final Product at Lowest Cost

"To do that, the requirements of plant design, chemical reaction and automatic control must all three be dovetailed together in a manner that will produce the final product at the lowest cost. For example, if a new control system succeeds in reducing pressure fluctuations, then perhaps plant design itself can be modified to use thinner and therefore less expensive vessels and pipes. In another case the reaction itself may be modified because a particular control system enables higher pressures and higher temperatures to be used with safety. Problems like these need a great deal of research and fundamental thinking if they are to be solved correctly."

The Scientist-economist

For a while we talked economics and Mr. Young introduced me to Dr. D. W. Gillings, a scientist now specialising in the task of determining what projects are likely to prove most worth while in terms of making the cost of the final product as low as possible.

"In principle," he told me with a smile, "the calculations should be fairly simple; but it is not always as easy as you might think. *For one thing, it is difficult to know in advance just how efficient a solution found in the laboratories will turn out to be in practice.*"

He went on: "The cost of better instrumentation and control often has to be balanced against a number of items where savings can be made. How much, for instance, will we save if thinner pipes and vessels are installed because better automatic control succeeds in reducing fluctuations? A question like this was recently put to one of the large digital computers, and the order of saving was found to be very considerable. Again, how much should one estimate for the profit of reducing wastage of raw materials by getting a lower proportion of sub-quality products?

"Can we, by means of instruments, work a given

PANSI, *the analogue computer, in course of assembly*

plant faster, which often means at a higher temperature, and thereby obtain a higher output from a plant of given size simply by speeding up the reaction? If so, what would be the effect from the point of view of fatigue of metals? These are the sort of considerations that have to be weighed up."

His exposition of the headaches of an economist was cut short by a message from my host. The computer was working. Would I like to see it?

I was ushered into the presence of "PANSI." It was impossible to escape the thought that this name, derived, as is usual, from the initial letters of the rather technical description of the machine, was somewhat inappropriate for the awe-inspiring concentration of dials and wandering wires which looked down on me from a dais at the end of the room.

In charge was Mr. C. R. Evans, another member of the Pangbourne staff. "What is a computer?" he said, echoing my inevitable question. "The term is generally used for a machine which performs mathematical operations. To refer to it as a 'brain' is rather misleading, since computers, in their present state of development at least, perform quite elementary arithmetical operations in strict accordance with a programme of instructions laid down by the machine operator. The essential point about computers is that they have a phenomenal appetite for the kind of work for which they are designed. Some types are able to work out in a few minutes numerical problems so lengthy that to solve them by human effort alone would be quite uneconomic."

"Does PANSI do this kind of arithmetical sum?" I asked.

"No," responded Mr. Evans. "This machine is of the type known as an analogue computer. Its answers are presented in the form of graphs traced out on the cathode-ray tube." The luminous green pattern on a small television type screen set in the middle of PANSI transformed itself instantly as my host turned the dials.

Electronic Meccano

Mr. Evans went on to explain to me that the purpose of PANSI is to enable the control engineer to set up simplified models of chemical plants and controllers. The plant is analysed into its basic components, and these are represented in PANSI by electronic units. The quantities such as temperature and pressure, the variations of which are of such vital importance in chemical plant, are here represented by variations in electrical voltage. *PANSI can be regarded as a sort of electronic Meccano, having parts which are equivalent to the pumps, pipes and vessels of the chemical plant.*

If it is desired to examine the effect of some rearrangement of parts of a chemical plant or the result of using a different control system, it is obviously much more convenient to juggle with the component parts of PANSI than to attempt all the rearrangement on the actual plant.

Quick Results

Not without pride Mr. Evans added: "We can, for example, double the size of a particular vessel in the electrical model of the plant merely by turning a dial on the computer. Altering the arrangement of the plant requires no more effort than is needed to shift the plug-in connectors which terminate the wires which now represent our pipes. It also becomes possible to 'try out' pieces of plant which exist only on paper. All this, of course, does not eliminate the need to operate pilot plants, or even to make adjustments and perform experiments on the full-scale plant. It does, however, eliminate some of the spadework, and gives a guide as to what to expect from the plant under various operating conditions."

Trial and Error Tests

One of the great advantages of the analogue computer is its tremendous speed of operation. I was given a typical example. The variation in temperature following a disturbance in the normal operation of a chemical plant may well take several minutes. The whole purpose of an automatic control is to get the plant back to normal operation in the least time. To try the effect of various adjustments on the plant itself would involve introducing deliberate disturbances and would take an hour or so, no doubt with an anxious plant manager hovering in the background. Much of the trial and error work can be done on a computer. The variations following a disturbance in the Pangbourne computer take place in a few thousandths of a second—so rapidly, in fact, that the pattern on the cathode-ray tube appears to change instantaneously as the control knobs are adjusted.

Computer Limitations

"Where do we go from here?" I asked. "Along what lines will the use of machines like PANSI develop?"

"The present limitations," I was told, "are that PANSI enables us to make models only of relatively simple plants. The computer must develop so as to enable us to simulate more and more complex chemical engineering units. Remember that the more complex these units are, the more difficult it is for the mathematician or chemical engineer to analyse them, and the more useful, therefore, will be the model.

"There is also another type of problem waiting to be attacked. Present types of controller require to be adjusted according to operating conditions in order to give the best control. It would be very useful to have an instrument to examine continuously the quality of control, and which would automatically adjust the controller according to its findings."

A controller to adjust a controller, I thought. What next?

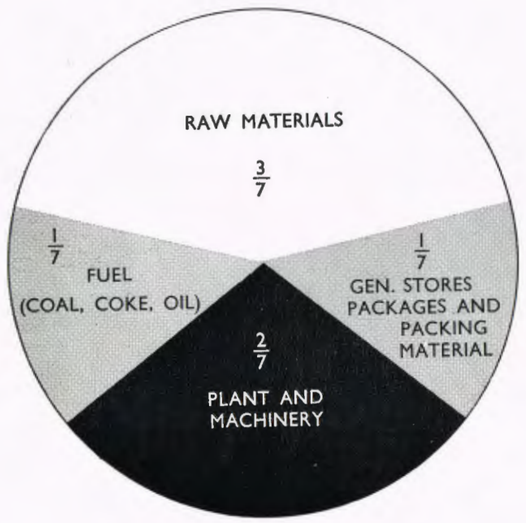
Information Notes

ONE YEAR'S PURCHASES . . . £156,000,000

By W. A. M. Edwards (Purchases Controller)

Last year we spent more than £500,000 every working day on buying raw materials, plant, machinery and general stores. By any standards this is a very big bill for a single concern. Here is a short survey of how the spending of so much money is organised.

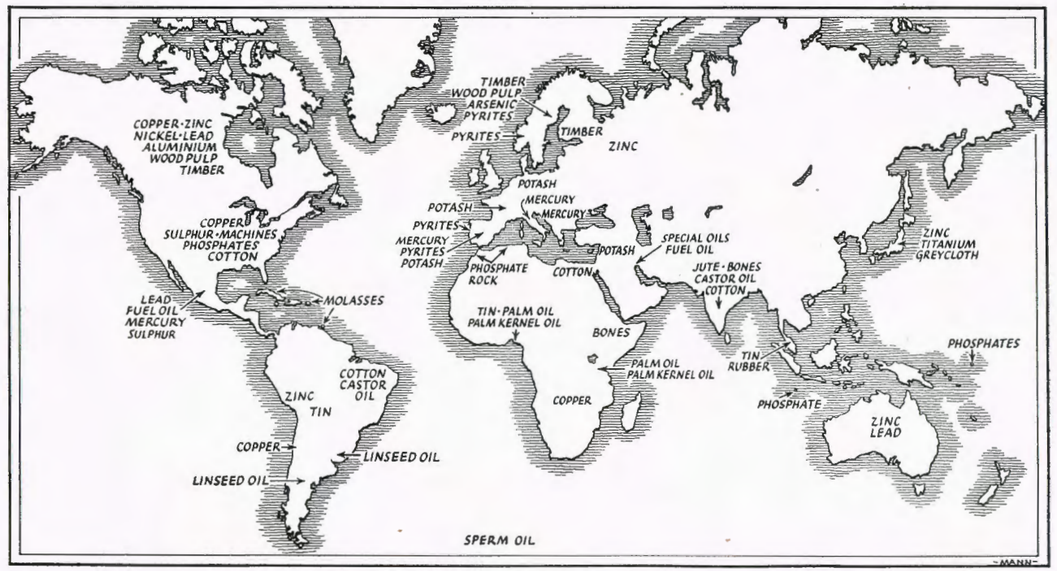
LAST year I.C.I.'s purchases totalled £156 million, averaging over half a million pounds every working day. The volume of work entailed will be more readily understood from the fact that there are 205 men and women continually employed in Central Purchasing Department.



What does the money buy, and where is it spent? Approximately one-seventh of the total of £156,000,000 is spent on fuel, that is coal, coke and oil; I.C.I. consumes 2½% of all the coal produced in Britain and about 4% of the coke. Three-sevenths is spent on raw materials; two-sevenths on plant and machinery; and the remaining one-seventh on general stores, packages and packing materials.

Raw materials for our factories which are imported from overseas account for approximately 35% of the total expenditure. The Company also buys materials and goods which are manufactured by U.K. suppliers from imported raw materials. The value of these imported raw materials is estimated at about 15–20% of I.C.I.'s total expenditure. Thus, about half the value of our total raw materials and other supplies originate overseas. The sources are world-wide. The map opposite indicates the major sources of some of our important raw materials.

I.C.I.'s bill for imported raw materials last year totalled approximately £60 million, while direct exports of I.C.I. products totalled £71 million. The Company thus paid its way from a national point of view, since the total value



WORLD *sources of I.C.I.'s raw materials*

of goods exported by the Divisions to overseas markets exceeded the value of imported raw materials. In addition, of course, many I.C.I. products sold at home find their way indirectly to export markets as more highly manufactured products.

A great deal of careful thought and study has been given over the years to developing the efficient purchasing and supply organisation within I.C.I., which today handles an increasing volume of work without any substantial increase in staff. Certain items, it has been found, can be handled more economically by the Divisions. For example, responsibility for buying new plants is delegated to the Divisions and ordered by the Divisional Supply Departments on behalf of the Chief Engineer concerned; certain engineering stores and a number of other items are bought locally by Supply Managers; while foodstuffs are bought by the Divisional canteens.

Under this system of delegation Divisions spend about 20% of the total sum. This 20% includes many small items; in fact, 600,000 local orders were placed last year by Divisions.

Our general buying policy is a long-term one. The problem is not only to buy at the lowest possible price. It is also in our interests to buy at a fair price. Many factors have to be taken into account. It is necessary to ensure, so far as one can, that supplies are always going to be available to keep our plants operating. The reliability of our suppliers and the continuity of our supplies are therefore points of major importance. Where possible, and where the added security justifies such action, supplies are drawn from more than one source, and very naturally home producers are preferred to overseas suppliers.

In the case of inorganic and organic chemicals and coal carbonisation products, careful forward planning is required, since our increasing requirements may necessitate the erection of new production capacity by the suppliers. On the other hand, our purchases of crop and animal products, such as linseed oil and glycerine, of fibres such as cotton and jute, of semi-manufactured or finished goods, and of non-ferrous metals, are small compared with world production. Prices are determined mainly by world commodity markets. Our buyers must therefore study international market trends and developments in many countries in order to buy efficiently.

Central Purchasing Department is now 27 years old. The decision to buy centrally was one of the earliest taken by the original board of directors. Twenty-seven years of experience and growth have proved that that policy decision was a wise one. The Divisions are served by specialist buyers who have an intimate knowledge of the industries from which they buy and of their particular group of materials, while in times of shortage competition between different parts of I.C.I. which might otherwise result in bidding prices up against ourselves has been avoided. There are, too, advantages in a central department which speaks for the Company as a whole and which takes an unbiased view of the Company's overall interests when Divisional interests conflict.

A WASTE DISPOSAL PROBLEM SOLVED

(Contributed by Alkali Division)

The making of soda ash at Alkali Division has always presented one particularly intractable problem: what to do with the large quantities of lime waste? Hitherto this waste has been dumped in unsightly limebeds; but now, after long research, a neat solution has been found: put the waste down the underground cavities left after the extraction of brine.

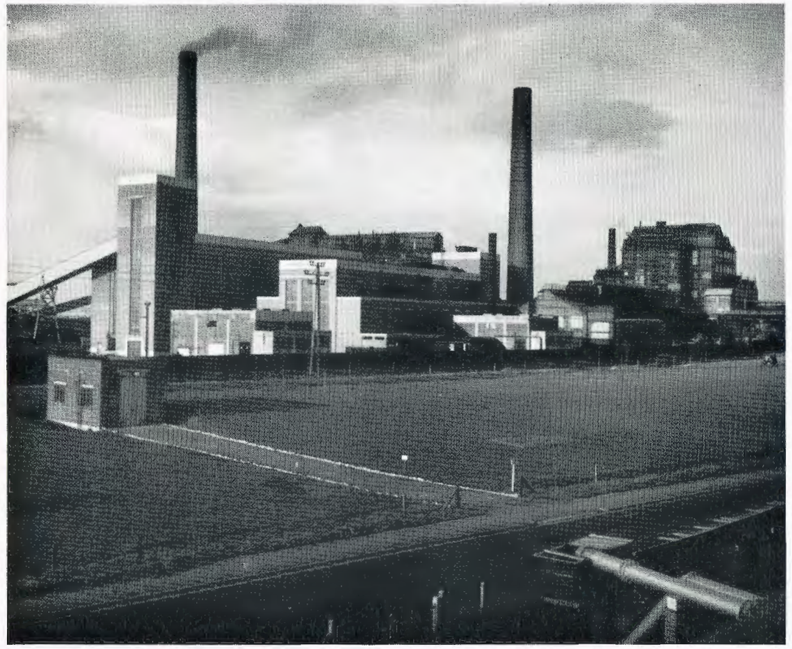
THE Ammonia-Soda Process is a neat and efficient cyclic chemical process which is able to produce very large quantities of a comparatively cheap industrial raw material in relatively little space and with not very many employees.

There is one blot on an otherwise almost ideal landscape: that is, that all impurities—about 30 lb. in every ton—that come in with the limestone, and all the ash in the coke needed to burn that limestone, pass unused through the system and leave with the otherwise clear works effluent. For every ton of finished product the Ammonia-Soda Process discharges about three-quarters of a cubic yard of this waste, which settles out of the effluent in the form of a white slimy mud.

Unfortunately this mud will never completely dry out however long it is left, and always retains the characteristics of a very soft clay. It cannot be dumped into railway wagons and taken away, but has to be kept in large compounds specially constructed for the purpose.

In the early days of the industry, while the works were relatively small, the disposal of this waste to limebeds was reasonably easy, as there were extensive undeveloped or sunken areas adjacent to the works. Today, however, some 500 acres of land have already been used for the disposal of waste, and with present-day outputs the problem of continued disposal to limebeds would have been formidable indeed.

LIMEBEDS AT LOSTOCK WORKS *in* 1954. *In future no more of these unsightly limebeds, which waste good agricultural ground, will be needed.*



FORMER LIMEBEDS AT LOSTOCK WORKS. *After suitable treatment, disused limebeds will eventually dry up and grow good grass.*

Numerous schemes for disposal of this waste otherwise than in limebeds have been investigated. Considerable research had shown that with certain admixtures the mud could be made into quite a reasonable cement. Unfortunately, fuel consumption was excessive and the cost of the product would have been higher than cement made by normal processes. Further, as distiller waste varies widely, the entire works would have had to be run to suit the cement plant and not *vice versa*, which would have been like a very small tail wagging a very big dog.

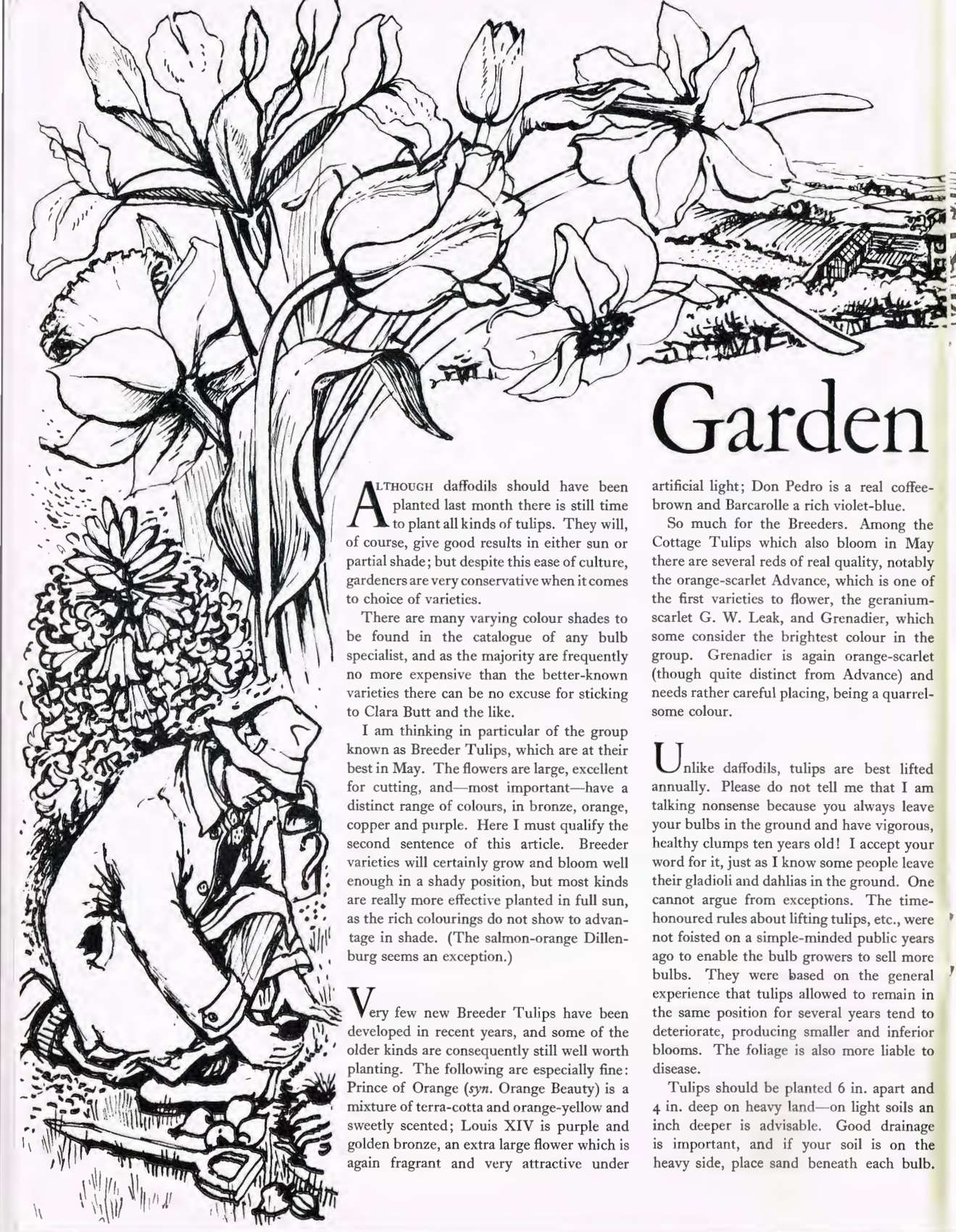
In the late 1940's the most promising solution appeared to be disposal to the sea by pumping the effluent to the Mersey estuary. However, the various authorities concerned with the Mersey estuary would not accept our proposals. A further proposal to take the mud in hopper barges beyond the Mersey Bar and dump it in deep water was far too expensive. It was then decided to push on with experimental work for the disposal of effluent down worked-out controlled brine boreholes and to construct interim limebed capacity until the technique of disposal down boreholes was established.

The production of controlled brine in Cheshire began in 1928. The cavities left in the deep salt beds are developed to a precise shape approximately the size of St. Paul's Cathedral, when further production is stopped and they are left full of saturated brine. The spacing of these cavities is carefully regulated so that the remaining system of support pillars is easily sufficient to carry the ground above it, and so that the cavities do not join one another. In this way safety from subsidence is assured, but it is at the expense of removing only about a quarter of the salt available. That is both economic and prudent as far as we can see now, and probably will be until the end of the century; but it is quite possible that our grandchildren—who by then should have a vast accumulation of knowledge and experience—can afford to be less careful than we.

It is into these worked-out cavities that we are now putting our distiller waste. But in order not to prejudice the chances of future generations recovering more of the salt remaining between the boreholes, the distiller waste must be carefully washed free from impurities that might contaminate the works brine supply. Further, the waste must be treated so that the mains to the boreholes do not quickly choke up with scale. This involves considerable problems of chemistry, technique and apparatus which are now, we hope, fairly overcome.

Of course, there still remain the boiler ashes and the grit. Fortunately a mixture of these makes an excellent filling. For some years we should be able to get rid of these by spreading them on top of the old limebeds as a layer of a sufficient thickness to provide a solid carpet over the soft mud below. When this outlet is finished, the ashes can be used to fill subsidence in the surrounding district. Fortunately, boiler ashes are quickly colonised by vegetation and, though close to it may appear sparse, the black patches are very soon clothed in green and in a comparatively few years, as we know from our older beds, coarse grass and meadow plants find a foothold.

We are not, therefore, being too optimistic when we hope that by the Alkali Division's 100th anniversary in 1973 the one-time eyesores around the works will be green flowering banks supporting rolling meadows as lush as were those that lie buried beneath them.



Garden Notes

By Philip Harvey

ALTHOUGH daffodils should have been planted last month there is still time to plant all kinds of tulips. They will, of course, give good results in either sun or partial shade; but despite this ease of culture, gardeners are very conservative when it comes to choice of varieties.

There are many varying colour shades to be found in the catalogue of any bulb specialist, and as the majority are frequently no more expensive than the better-known varieties there can be no excuse for sticking to Clara Butt and the like.

I am thinking in particular of the group known as Breeder Tulips, which are at their best in May. The flowers are large, excellent for cutting, and—most important—have a distinct range of colours, in bronze, orange, copper and purple. Here I must qualify the second sentence of this article. Breeder varieties will certainly grow and bloom well enough in a shady position, but most kinds are really more effective planted in full sun, as the rich colourings do not show to advantage in shade. (The salmon-orange Dillenburg seems an exception.)

Very few new Breeder Tulips have been developed in recent years, and some of the older kinds are consequently still well worth planting. The following are especially fine: Prince of Orange (*syn.* Orange Beauty) is a mixture of terra-cotta and orange-yellow and sweetly scented; Louis XIV is purple and golden bronze, an extra large flower which is again fragrant and very attractive under artificial light; Don Pedro is a real coffee-brown and Barcarolle a rich violet-blue.

So much for the Breeders. Among the Cottage Tulips which also bloom in May there are several reds of real quality, notably the orange-scarlet Advance, which is one of the first varieties to flower, the geranium-scarlet G. W. Leak, and Grenadier, which some consider the brightest colour in the group. Grenadier is again orange-scarlet (though quite distinct from Advance) and needs rather careful placing, being a quarrelsome colour.

Unlike daffodils, tulips are best lifted annually. Please do not tell me that I am talking nonsense because you always leave your bulbs in the ground and have vigorous, healthy clumps ten years old! I accept your word for it, just as I know some people leave their gladioli and dahlias in the ground. One cannot argue from exceptions. The time-honoured rules about lifting tulips, etc., were not foisted on a simple-minded public years ago to enable the bulb growers to sell more bulbs. They were based on the general experience that tulips allowed to remain in the same position for several years tend to deteriorate, producing smaller and inferior blooms. The foliage is also more liable to disease.

Tulips should be planted 6 in. apart and 4 in. deep on heavy land—on light soils an inch deeper is advisable. Good drainage is important, and if your soil is on the heavy side, place sand beneath each bulb. Bonemeal may also be worked into the soil before planting, as this helps the formation of new bulbs. All bulbs should be in the ground by the middle of November. Incidentally, early planting in, say, September should be avoided, as the foliage usually grows too rapidly and may be damaged by frost or "fire" disease.

Hyacinths have always been more expensive than tulips, presumably because they are slower of increase. Offsets taken from the parent bulb do not usually flower until the third year, so the bulb grower is compelled to increase his stock in other ways. For example, mature bulbs may be cut crossways at the base to a depth of half an inch. This is done before planting. Small bulbs are eventually produced on the edges of these cuts.

A good hyacinth bulb should be firm, not soft. The yellow varieties make rather smaller bulbs than other colours. A light, rich soil is ideal. Some experts advise covering with a layer of leaves or straw in winter to protect the bulbs from frost, but I have never found this necessary. Plant about 8 in. apart and 5 in. deep. As with tulips, annual lifting is advisable.

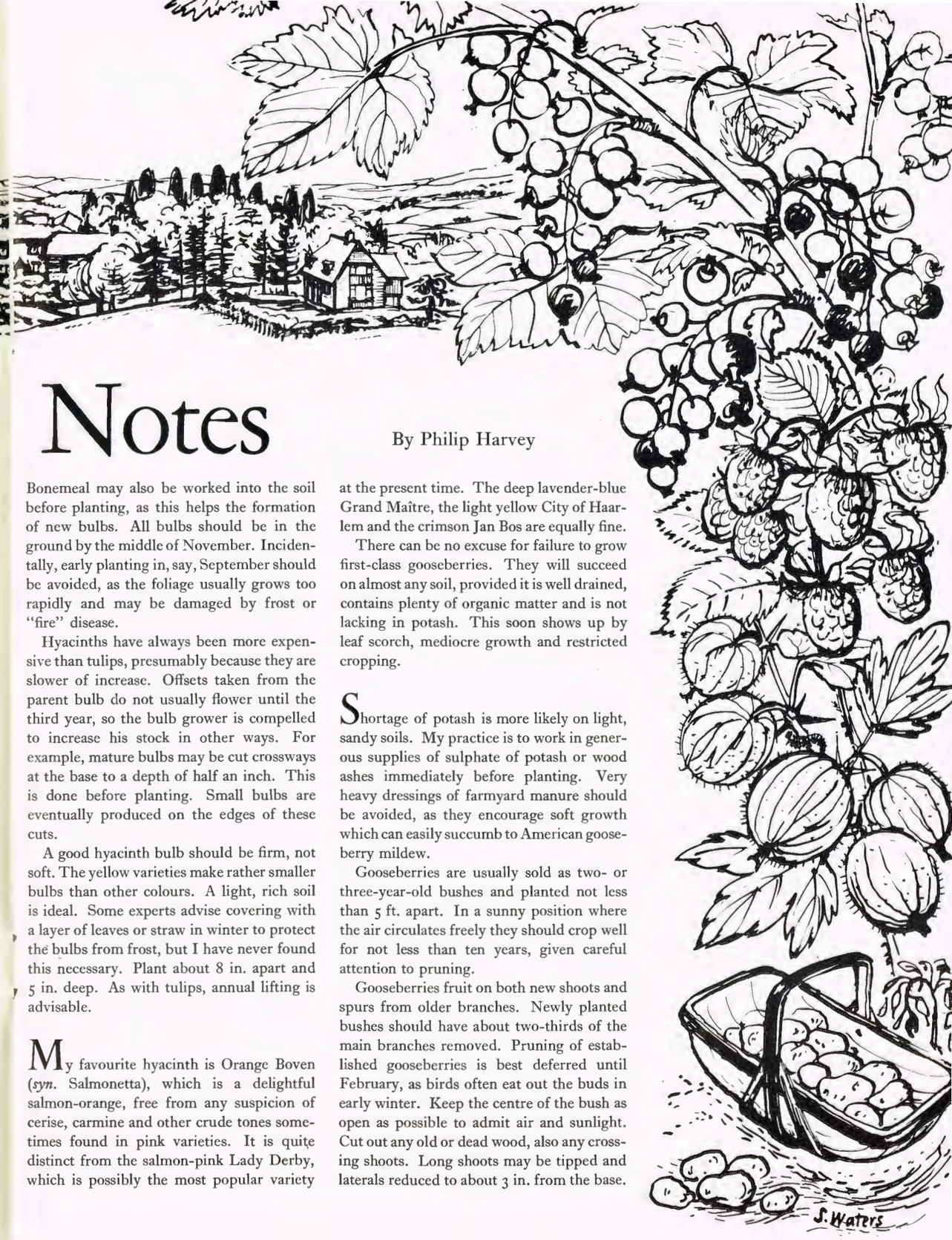
My favourite hyacinth is Orange Boven (*syn.* Salmonetta), which is a delightful salmon-orange, free from any suspicion of cerise, carmine and other crude tones sometimes found in pink varieties. It is quite distinct from the salmon-pink Lady Derby, which is possibly the most popular variety at the present time. The deep lavender-blue Grand Maître, the light yellow City of Haarlem and the crimson Jan Bos are equally fine.

There can be no excuse for failure to grow first-class gooseberries. They will succeed on almost any soil, provided it is well drained, contains plenty of organic matter and is not lacking in potash. This soon shows up by leaf scorch, mediocre growth and restricted cropping.

Shortage of potash is more likely on light, sandy soils. My practice is to work in generous supplies of sulphate of potash or wood ashes immediately before planting. Very heavy dressings of farmyard manure should be avoided, as they encourage soft growth which can easily succumb to American gooseberry mildew.

Gooseberries are usually sold as two- or three-year-old bushes and planted not less than 5 ft. apart. In a sunny position where the air circulates freely they should crop well for not less than ten years, given careful attention to pruning.

Gooseberries fruit on both new shoots and spurs from older branches. Newly planted bushes should have about two-thirds of the main branches removed. Pruning of established gooseberries is best deferred until February, as birds often eat out the buds in early winter. Keep the centre of the bush as open as possible to admit air and sunlight. Cut out any old or dead wood, also any crossing shoots. Long shoots may be tipped and laterals reduced to about 3 in. from the base.



Derbyshire Well-dressing

By Crichton Porteous

Every year the people of Derbyshire dress the wells before they are blessed by the vicar. They dress them with flower pictures intensely moving and beautiful, portraying Biblical scenes.

Colour photographs from the author's collection

THE Australian editor of the Sydney *Sun*, printing a review of a book on well-dressing, thought it necessary to explain to his readers that it was not about being well dressed, but about a curious English custom to do with water. He should have said that it is a unique Derbyshire custom.

Instead of simply draping the wells with leaves and laying flowers beside them, the Derbyshire custom is to compose large pictures entirely of flowers and petals and other natural things, such as moss, bark, fir-cones, and the bright spar and silica out of the local rocks. The resulting pictures are like gorgeous tapestries set in ornate, many-coloured frames.

A brilliant plot of grass in the picture turns out to be close-cropped parsley. The bricks in a house wall are all individual red hawthorn flowers tightly set together in perfectly regular brick shapes, the mortar being lines of tiny larch cones. Sheep consist entirely of white clover flowers packed close together, or of feverfew heads; donkeys are of grey lichen. The faces, hands and feet of humans are cunning arrangements of the bleached skin taken from the root end of sticks of rhubarb.

The origin of this peculiar style of well-dressing is a complete mystery. Derbyshire wells seem to have been dressed in the common way with branches and bouquets, as a thanksgiving for water, from as far back as Roman times. The picture dressings began only in the early nineteenth century.

Now we have families who have dressed wells for three and four generations, and there is a rich accumulated store of knowledge about well-dressing.

The foundations of the pictures and the frames round them are strong wooden trays, about half an inch deep. The tray for the main picture is usually 6 to 8 feet long and broad in proportion. Into the tray bottom are tapped small nails, the heads being left a quarter of an inch up; or laths are nailed across the bottom; or half-inch holes are bored through. The tray is then filled with clay cleaned of stones and hard lumps, and softened with water and carefully kneaded to about the consistency of butter. The clay is packed round the nail heads, or worked behind the laths or into the holes, all three means serving the same purpose of keying the clay firmly into the trays. The clay surface is levelled flush with the tray edges. Usually the tray is then put face up on trestles, though a few dressers, as they are called, set their trays in the final position, perpendicular behind the well.

Suppose, however, the tray is set up on trestles. On the smooth clay is now laid face up a line drawing of the proposed picture, the drawing exactly fitting the tray. With a wooden skewer the outlines of the picture are pricked neatly through, so that when the drawing is lifted a faint tracing remains in the clay.

The filling in of such a large area with petals, cones and other small items is a slow process, and it is necessary to begin a week before the day of the "opening." The outlines of the picture are first made plainer and more permanent by putting in small alder cones, known as "black knobs," or rhubarb seeds, whichever are to be got more easily. Then the parts of the picture that can be best done with bits of bark, moss, lichen or spar are filled in, and on the last night

FOLLOW ME, *a well-dressing screen at Stoney Middleton, Derbyshire. This beautiful screen is entirely decorated with petals and the like, which are pressed into a soft clay surface.*

THE GOOD SHEPHERD, *a small screen decorated by a child at Bonsall, Derbyshire. The lettering is done with tiny berries. This screen won first prize in the class for children.*

the dressers all work their hardest putting in the petals that make the gowns, headdresses, and jewels of the finished pictures.

Each piece of bark or petal is dabbed lightly on the clay and sticks quite simply. Petals are overlapped from above, in the manner of slating, so that if rain comes after the screen has been erected the petals will not wash off.

The number of petals needed is vast. Once, using helenium petals, which have a division down the centre and must be put in exceptionally close, I calculated that in a couple of hours two of us used about 400 to fill a space only nine inches square!

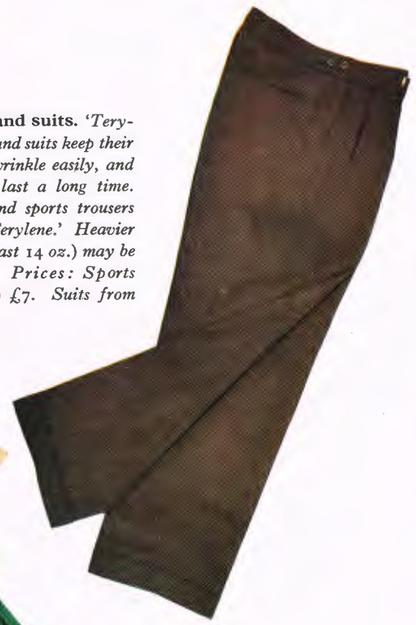
The best time to see a dressing is before it is set up, just as it is being completed. Nearly always the time is after midnight. The dressers are working intently and silently under electric lights hanging on long flexes close over the tray. Imagine the reflection from the thousands of fresh, almost dewy petals, all set so closely and softly together! As one goes out into the deep blue of the night, the colours glow in one's eyes—it is a picture one will never forget.

SHE LAID HIM IN A MANGER, *another Bonsall screen. In this screen the faces and hands are modelled in dark clay touched up with paint, a practice which departs from the usual tradition. The tiger-striped dress in flowers has been particularly admired.*

Round the Shops with I.C.I. Fibres

Fibres Division was formed in April 1956. It was a move so long expected that the announcement caused little stir. But today its products are making their influence felt and are increasingly available in the shops.

Stockings. *'Terylene' stockings are now available in the shops. They offer greater sheerness, more comfort, and wonderful washing qualities. Price 9s. 11d.*



Sports trousers and suits. *'Terylene' sports trousers and suits keep their shape well, do not wrinkle easily, and the trouser creases last a long time. Lightweight suits and sports trousers are usually 50% 'Terylene.' Heavier weight fabrics (at least 14 oz.) may be 35% 'Terylene.' Prices: Sports trousers £4 10s. to £7. Suits from £12 upwards.*

Pyjamas. *Cotton and 'Ardil' pyjamas can be bought in most big shopping centres at prices ranging from 32s. 6d. to 47s.*

Skirts and blouses. *Skirts of at least 50% 'Terylene' are now available throughout Britain. There is a large variety of styles, pleatings, patterns and shades. Prices from £2 10s. to 15 guineas. Blouses of 100% 'Terylene' can be bought in most shopping centres.*

Nightdresses and lingerie. *Many different styles of 'Terylene' lingerie and nightdresses are in the shops. Long-wearing qualities and ease of washing are the special qualities offered by 'Terylene.'*

Shirts. *This is one of the cotton/wool/'Ardil' shirts now in the shops. Prices vary from 30s. to 45s. Your local outfitter also probably stocks 'Terylene' shirts at between 52s. 6d. and £5.*

Pillows and quilts. *Wonderfully comfortable, washable 'Terylene' pillows and quilts are gradually becoming easier to find. Filled and sometimes covered with 100% 'Terylene,' their prices are: Pillows from 35s. to £3. Quilts from £8 to £15.*

Children's dresses. *Warmth and perfect comfort are the main virtues of this cotton/'Ardil' child's dress. Dresses like this one and in many other styles can be bought now in most big shopping centres. Prices, which vary according to style, begin at about £2.*

Socks and ties. *Both 'Terylene' "winners." Available in many different styles and patterns and stocked by outfitters throughout Britain. 'Terylene' "stretch" socks as well as the normal variety are now on the market. Prices: Socks from 7s. upwards. Ties from 12s. upwards.*

Dresses. *There are 'Terylene' dresses in a wide variety of weights and styles for all seasons. They are in both 100% 'Terylene' and a blend of 55% 'Terylene' with wool. Prices vary considerably according to style.*

I.C.I. NEWS

NEW WELWYN LABORATORIES

THE new Technical Service and Development Laboratories of Plastics Division, Welwyn Garden City, were opened by Mr. Clifford Paine, I.C.I. Development Director, on 28th September. Probably the finest and best equipped of their type in the world, the laboratories and their equipment have cost a total of £500,000.

Before opening the laboratories Mr. Paine told a large gathering, which included directors and representatives of senior management, that theatrical analogies were not entirely inappropriate on such an occasion. "After all," he said, "a new laboratory is like the script of a new play. It does not come to life until it has been occupied by good performers, who have got to breathe their own imaginative stuff into it. It is true, of course, that to achieve a good performance it has got to have a responsive audience. In that sense a technical service laboratory must satisfy and stimulate a critical audience of customers."

Mr. Paine said that he found it difficult to realise that polymer chemistry and technology, the special field of the Plastics Division, was so young, because its growth had been so dramatic. The creation of the new laboratories was evidence that Plastics Division recognised that the polymers and plastics field was a dynamic one, in which there were still to be many progressive changes in technology.

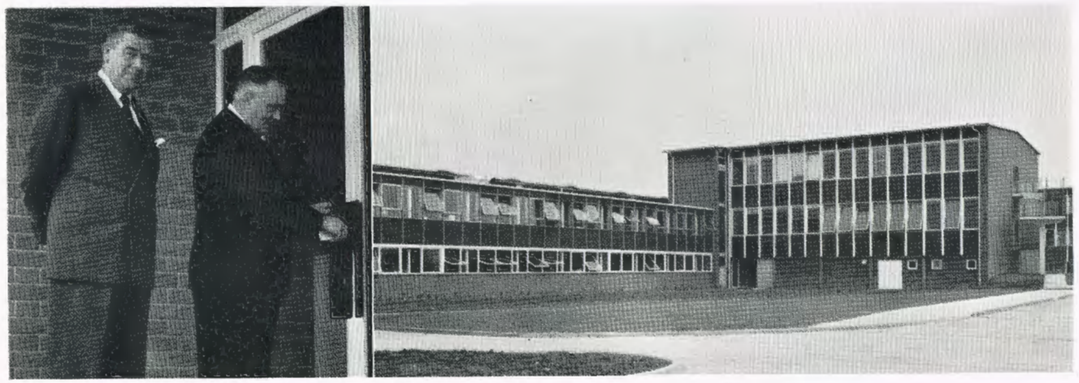
Mr. J. C. Swallow, chairman of Plastics Division, presented Mr. Paine with a key mounted in 'Perspex.' The key was a duplicate of the one with which Mr. Paine opened the new laboratories.

Mr. Swallow, after reading a message of good wishes from Sir Alexander Fleck, said that the plastics industry was growing faster than any other part of the chemical industry. This rapid growth was a challenge to the Division to see that the growth was an ordered one.

The new laboratories have a working area of 50,000 sq. ft., and the staff will total 250. Since the laboratories will have to cater for a wide variety of practical operations, from the purely scientific to the technological and semi-technical, the buildings house not only conventional chemical and physical laboratories but also equipment typical of that used by I.C.I.'s customers.

There are seven fabricating laboratories. A gallery of offices overlooks the fabricating laboratories, and leading from the gallery are two laboratory wings where physical and small-scale testing can be carried out.

Throughout the laboratories the architect, Mr. E. D. Jefferiss Mathews, has made considerable use of plastic materials—for example, 'Perspex' for roof lighting and for the fluorescent lighting fittings, vinyl flooring and polythene plumbing.



The new Technical Service Laboratories at Welwyn were officially opened in September. Left: Mr. C. Paine opening the entrance. With him is Mr. J. C. Swallow. Right: General view of the laboratories.

HEAD OFFICE

Dr. J. A. Wilcken

Dr. J. A. Wilcken, Foreign Editor of *Endeavour*, died on 9th October in his seventy-sixth year. The loss is great, for the foreign editions of *Endeavour*—French, German, Italian and Spanish—together comprise about half the total number of copies printed, and to the meticulous care with which he supervised their preparation from the inception of the journal in 1942 is due much of the high prestige *Endeavour* enjoys abroad.

The unusual combination of scientific and linguistic knowledge which he had acquired in his earlier years contributed much to the success of his work with *Endeavour*. Born in Aarhus, Denmark, in 1881, he took an engineering degree at Copenhagen University in 1906. He then travelled extensively in Europe before going to the United States, where he was for a short time employed as a draughtsman by the Westinghouse Company in Pittsburgh. There followed a brief stay in Brazil, and then, in 1911, an appointment with the Argentine meteorological office in Buenos Aires. From 1914 to 1919 he was lecturer in physics at the *Colegio Nacional*, and during this time he took the Ph.D. degree of La Plata University. For a short time in 1919 he was engaged in research at the Cavendish Laboratory, Cambridge. In 1920 he was appointed lecturer in mathematics at Sunderland Technical College and four years later went to Armstrong (now King's) College, Newcastle upon Tyne, as lecturer in electrical engineering. During this time he took the B.Sc. degree of London University. In 1937 he came to the Institution of Electrical Engineers, London, where in 1940 he was appointed editor of *Science Abstracts*.

A man of great reserve, he sought his main relaxation in music, to which he was passionately devoted; he was himself an accomplished pianist. In his later years he derived much pleasure from his many visits to Glyndebourne.

BILLINGHAM DIVISION

Beer Mats aid Road Safety

An idea put forward by Mr. Stanley Ralph, Work Study Estimator at Prudhoe, is being used throughout the country in the "Mind that Child" road safety campaign.

Mr. Ralph, who is chairman of Prudhoe Urban Council Road Safety Committee, was enjoying a glass of beer one evening when he noticed that his beer mat had one blank side. He thought this would be an excellent place for a road safety slogan and suggested it at the next meeting of his committee. The idea moved on to the Northumberland County Road Safety Committee, to the Royal Society for the Prevention of Accidents, and finally to the Ministry of Transport.

The Ministry approved its use for the "Mind that Child" campaign, and Mr. Ralph's committee has received a batch of the new mats. Each mat carries a picture of a child stepping off a pavement with the words "Children Depend on You." Half the child's figure is blocked out by the campaign's main symbol—a hand carrying the words "Mind that Child."

On the Stage with Chaplin

At 70 Mr. Syd Harrowing is still an agile member of the Billingham Commercial Rail Traffic Section. It is hardly surprising, perhaps, as he was once a professional acrobat and tumbler.

Starting off as a programme boy in a West Hartlepool theatre, where he saw some of the tricks and decided to have a try himself, Syd made his first stage appearance at

Mr. Syd Harrowing (right) tells driver Bob Grainger and shunter Monty Nelson one of the stories from his stage career

the age of 10. It was some time after this that he met another young trier "on the boards"—Charlie Chaplin. "Charlie was a few years younger than me," said Syd, "but even then you could see that he would go places. At the time he was with Fred Karno and his Mumming Birds, and I worked with them for several weeks." Among other famous theatre personalities that Syd worked with were Marie Lloyd, George Robey and G. H. Elliot.

Syd left the stage at 17 because his father thought that in the theatre he might be falling into a wicked way of life. His wanderings were not over, because he went to work on the railways in Ceylon in 1926, but his wife became ill and he returned to Britain, starting as an I.C.I. loco driver in 1928. Many times he has startled his workmates by doing a somersault from the footplate to the ground. However, Syd had to give up driving four years ago because of his age, and he admits now that somersaults make him a bit dizzy.

CENTRAL AGRICULTURAL CONTROL

Brighton Conference

A conference entitled "Agriculture in the British Economy" will be held at the Grand Hotel, Brighton, on 15th to 17th November. It has been called to consider the place of agriculture in the economy of the United Kingdom and particularly to examine the part which home agriculture can, or should, play in providing for our future

food requirements. At present approximately half our food comes from British farms and half is imported. In order to finance the production of home-grown food the nation spends over £200 million annually on agriculture subsidies, and to pay for the food we import absorbs over 40% of our export earnings. These facts raise questions of great national importance affecting our future.

I.C.I. has therefore decided to hold this conference to provide an opportunity for persons interested in agriculture, industry, banking and economics to express their views on the future of British agriculture and the directions in which it might be developed in the interests of the nation and the farmer. The conference has the approval of the Ministry of Agriculture, Fisheries and Food.

Sir Alexander Fleck will open the conference and take the chair at the first session. Members of the Main Board and the board of Central Agricultural Control will be among the contributors. The conference, limited to two hundred delegates, including contributors, has been full for some months.

METALS DIVISION

Safety Achievement

For the first time in Metals Division's history 2,000,000 accident-free hours have been worked by Marston Excelsior's factory at Wolverhampton. This unique achievement means that the factory, which employs 1145 men and 434 women, has not had a lost-time accident since 21st February. The first million was reached on 7th June and the second on 1st October. Every individual who has contributed to this wonderful record is to be congratulated.

NOBEL DIVISION

New Tug Launched

On 4th October a new tug, the M.T. *Garnock*, was launched from the ways of George Brown & Co. (Marine) Ltd. shipyard at Greenock. As the tug began to move she was named by Mrs. James Craik, wife of the chairman of

Mrs. James Craik names the "Garnock" as the vessel leaves the ways. With her are Dr. Craik (Division chairman) and Mr. George Brown.

The M.T. "Garnock" is waterborne for the first time

Nobel Division. It was a good launch. The new tug will operate for the Irvine Harbour Co. and will replace the present vessel, a 70-year-old paddle ship.

When the ship goes into action it will serve as a floating laboratory for I.C.I. Paints Division. The ground paint on the underwater hull is not all similar. Panels have been treated with paints of different formulae, so that when the first major overhaul takes place after a long period of running, Paints Division technical men will assess the comparative worth of these different compositions.

Fatal Explosion at Ardeer

With regret it is reported that an explosion occurred in Ardeer Factory on 29th August during the course of preparation of a sensitive explosive compound under the supervision of a chemist. The chemist, Mr. John Williamson, of 15 Montgomerie St., Ardrossan, was so seriously injured that he died while being conveyed to hospital. Of the four other persons in the building two were injured, one being taken to Kilmarnock Infirmary for treatment.

Mr. Williamson, a B.Sc. of St. Andrews University, had been with Nobel Division for five years. He was 32 years of age and is survived by his widow and two children.

Antarctic Aid

When the main party of the Transantarctica expedition sails at the end of the month their ship will carry Nobel Division products to help the exploration. Last winter Nobel Division explosives and accessories did good work when the *Theron* was caught in the ice-pack of the Weddell Sea.

Nobel '704' explosives intended for blasting landing sites out of the ice and for hewing rough roads were instead used to jar the vessel free from the ice stranglehold. Nobel '704' is manufactured at Roburite Factory.

The present contribution is designed for seismic work on the Continent. One thousand pounds of Nobel's explosives '704' in tins will be accompanied by seismic electric detonators of different sorts, shotfiring cable, connecting wires, plastic submarine joints and one case of 'Cordtex,' covered with 'Alkathene' for low-temperature work.

Recently two members of the expedition, Mr. G. Pratt, the seismologist, and Flt. Lt. G. Haslop, an R.A.F. pilot on loan to the expedition, visited Ardeer.

A Novel Job

Recently two Nobel Division Technical Service men became cracksmen and attempted to blow safes with explosives. This surprising direction of their skill was completely legal, and the fact that they blew locks but failed to crack the safes was highly satisfactory. These jobs were not accomplished stealthily in the black of the night; on the contrary, the work was done in broad daylight, and the scene of the operation was the works yard of the Ratner Safe Co., London.

The efficiency of certain new security devices on safes was being tested and demonstrated. Mr. D. Stenhouse and Mr. T. Hill were the Nobel Division Technical Service men who found themselves in the unaccustomed roles. Their job was to apply the best contemporary explosives technique in an attempt to break open new safes constructed by the Ratner Safe Co.

Besides the normal locks, these safes were fitted with special devices which would operate both when the safe was locked and when it was blown. Thus the cracksmen who had successfully blown the lock would come up against the ultimate frustration of finding out that the explosive action, far from making access easy, had bolted the door irrevocably against them.

PHARMACEUTICALS DIVISION

They climbed the Matterhorn

Miss Denise Shortall, who recently transferred to the Division's Research Department from Dyestuffs Division, is a mountain climber of note. Two years of rock climbing in Derbyshire, Wales and the Lake District provided good training for her first alpine trip to Chamonix in 1954. Another trip to Chamonix followed in 1955, but her greatest achievements took place this year on an expedition to Zermatt, when, in company with a fellow member of the Pinnacle Ladies' Climbing Club, Miss Shortall made the ascent of the Matterhorn, 14,782 ft. high. On their return to Zermatt they were delighted to find that they were the first women to make the climb without a guide for over twenty years, and only about the third pair ever to reach the top.

Miss Denise Shortall

Other peaks "bagged" by Miss Shortall and her friend during their very intensive fortnight at Zermatt included the Alphubel (13,000 ft.), Zinalrothorn and the Trifthorn, both over 12,000 ft.

WILTON WORKS

Marine Survey for Natural Gas

Although there has been no further drilling of deep boreholes in Eskdale for some time, B.P. Exploration Co. Ltd. (formerly D'Arcy Exploration Co. Ltd.) and I.C.I. have not given up their quest for appreciable accumulations of natural gas.

Last month a survey was made of an area of the sea to the east of Robin Hood's Bay, Yorkshire. The S.S. *Seislim*, a vessel of about 1000 tons specially modified for seismographic work, was used.

The method employed at sea requires the detonation of charges of 16⅔ lb. of explosive at a depth of 4 ft. under water, there being no need for boreholes in the sea bed. The charges are fired a quarter of a mile astern of the ship at about quarter-mile intervals.

A streamer, half a mile long, which contains geophones to record energy from the explosions reflected by geological horizons below the sea bed, trails behind the ship. The explosions produced columns of water as high as 200 ft.

It is believed that these undersea explorations will reveal valuable information about the disposition of geological formations off shore.

Prison Governors prefer Polythene

Our *Magazine* correspondent at Wilton Works sends us the following story about polythene.

At the British Plastics Federation conference held recently at Torquay Mr. D. Radford, a director of E. K. Cole Ltd., in a reference to kitchen articles made of polythene, commented: "I am reliably informed that these articles are growing in favour among the Governors of Her Majesty's prisons, for when warders are struck by recalcitrant prisoners with washing-up bowls the damage to the warder is less if a polythene bowl is used instead of a metal one."

OUR NEXT ISSUE

Our leading article in next month's *Magazine* is on Nitroglycerine manufacture and has been written for us by Harry Hutchison, editor of the *Nobel Times*.

Then comes a colour feature on Alkali Division's works gardens. The accompanying article tells the history of the gardens scheme from the first tentative efforts to tidy up the Winnington site in 1949 to the gardening section's latest triumphs at the famous Shrewsbury and Southport Flower Shows.

We follow with an article on autumn colour in America by K. D. Wadsworth of General Chemicals Division in which he discusses the reasons for the spectacular autumn colourings of the trees in the New England area. The article is illustrated with some of Mr. Wadsworth's own photographs.

NEWS IN PICTURES

While visiting *Lake Magadi Works, Kenya, Sir Alexander Fleck opened the new school for African children erected as part of the Company's town planning scheme. Below: Sir Alexander plants a tree in the school grounds to commemorate his visit*

Marston Excelsior, *Wolverhampton, recently made their largest 'Marex' high-efficiency heat exchanger. This weighs 4 tons and is destined for the British Oxygen Engineering Co.*

The joint *Paints Division and Leathercloth Division stand at the Commercial Motor Show,* 1956, *held at Earls Court*

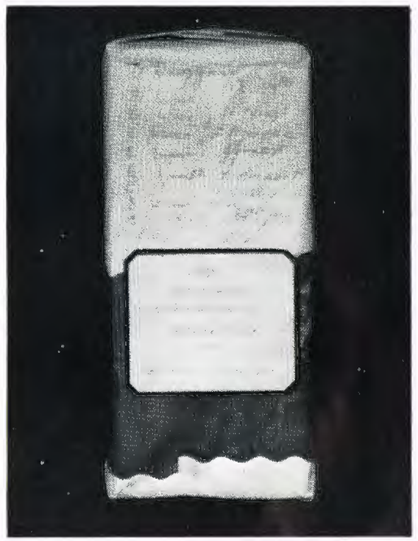
Four girls *from the Ardeer Recreation athletics team who won the Scottish medley relay championship at Shotts and set up a new Scottish record*

Dr. J. Craik, *Nobel Division chairman, presents Dr. R. P. Bell, president of the Faraday Society, with a replica of Michael Faraday's experimental apparatus made from icing sugar by chef Barr of Sauchiehall Street*

'Terylene' dress *to be worn by all women members of the British Olympic team at the opening ceremony of the Olympic Games at Melbourne*

Stoke Works chimney *built by William Gossage in* 1836 *is being demolished. Work began in August*

Paints Division's *use of individual polythene can liners, as seen in the above picture, gives an improved standard of cleanliness and shows an advantage in that the need for cleaning containers is greatly reduced*



Open pan *salt production has ended at Salt Division's Stoke Works. Autographed, the last cut lump has a place of honour in the office museum*

In I.C.I.'s film *"Point of New Departure" Mr. J. R. Whinfield, discoverer of 'Terylene,' illustrates atom arrangement in fibres*

Washing machine *cabinets leaving the 'Granodine' plant at Hoover (Washing Machines) Ltd., South Wales, in Paints Division's new film "I.C.I. Metal Pretreatment in Industry"*

Dr. Adam Lees *(left), Nobel Division Labour Manager, presents the new trophy made by Ronald Vickers, Billingham engineering apprentice, to Irvine Johnstone, skipper of the Synthonia soccer side which beat Ardeer in September*

The new *'Splendex'* 1003 *is being used in the manufacture of evening sandals and dance shoes*

New office blocks *at Albert Embankment seen from Millbank. I.C.I. has leased offices at No.* 20 *(centre block above)*

Blackley Recreation Club *motor cycling team were fourth in R.A.C./A.C.U. National Rally:* 600 *miles in* 24 *hours*

Three Peak Record

By Trevor G. Buckland

One minute past midnight last May, a young laboratory assistant of Dyestuffs Division set out on an unusual mission. It was to climb the three highest peaks of Wales, England and Scotland in record time. He succeeded—with over 6 hours to spare.

ALTHOUGH breaking records is not a pastime everyone indulges in, the opportunity came my way in the form of my hobby—climbing.

The object was to climb Snowdon (3560 ft.) in Wales, Scafell Pike (3210 ft.) in the Lake District, and Ben Nevis (4406 ft.) in Scotland and travel about 460 miles in less than the record time of 22 hours 38 minutes. Climbing, walking, running and fast cars were the only means of transport. No planes were allowed.

We, team mate Harold Aspland and myself and three cars, set off at one minute past midnight on 24th May from a small farmhouse on the foothills of Snowdon about a mile from Llanberis. The weather was uninviting, with a strong cold wind blowing and dark low clouds covering the moon.

Reaching the top section of the mountain track—so well known to visitors—we were stopped several times in our tracks by the terrific gusts of wind, but we reached the summit in 58 minutes. We turned about in our tracks and ran down the mountain, the following wind being more of a hindrance than help—and we were pleased to see the powerful beam of a car spotlight at 1250 ft. which guided us safely.

Down at the bottom by 1.28 a.m., we left for the Lake District amidst clouds of dust, tearing on at speeds of up to 90 m.p.h. Ticking by, the minutes were precious, and by 3 a.m. we were nearing Birkenhead—and how eerie is the empty Mersey Tunnel!

Liverpool, Lime Street Station, was the meeting place for despatch of press reports and photographs.

On again through the night. Narrow hairpin bends and mist did not make the drivers' task any easier, but with incredible accuracy and skill they drove on into the dawn, and by 5.30 a.m. the Scafell Range was seen shrouded in the cold mist of that early dawn.

Now it was boots on, sweaters off, and with the last bite of food and a drink of water we jumped out of the cars at the foot of England's highest mountain, Scafell Pike. The time—5.50 a.m.

Up our pre-planned route we went, the still silence being broken only by the crunching of nails on rocks and the incessant panting of two very young men. Cloud base was down to 1500 ft., and visibility was then a mere five yards. In cold drizzling rain we got lost at 2000 ft. and pressed on blindly into the swirling mist. After fourteen worrying minutes the ominous precipitous approaches of Scafell loomed up and the flat wall of towering rock was surmounted by climbing a gully. Racing along a well-worn path to the summit, we arrived there at 7 a.m. utterly wet through but satisfied. The next forty minutes of that treacherous misty descent brought two bedraggled climbers down to 1300 ft. We raced to the waiting cars and reached them at 7.40 a.m.

Wet road conditions cut the speed down to 80 m.p.h., but that did not stop us stripping completely, drying ourselves out and re-dressing—quite an experience at that speed.

We touched 104 m.p.h. on the way to Carlisle, and at 9.20 a.m. stopped to refill flasks with hot tea and send off more press reports. Bypassing Glasgow, we pressed on to Stirling, Callander, Strathyre, Rannoch Moor, through Ballachulish, and on to a prearranged waiting ferry. Crossing Loch Leven, we prepared for the last ordeal—Ben Nevis, the pride of Scotland.

TREVOR BUCKLAND (*left*) *and team mate Harold Aspland climbed the highest mountains in Wales, England and Scotland in the record time of* 16 *hrs.* 30 *min.*

At 2.04 p.m. we were off again into the low clouds, but they seemed to rise before us as we ascended. After following the pony track for 1½ miles we decided on a direct assault. 800 ft. from the summit we encountered deep snow, and then to add more trouble the mist suddenly enveloped us, and after pushing on for a while it started to snow. Soaked shirts and shorts were not quite the thing for this climate. Puffing, panting, often on hands and knees, we managed to reach the summit at 3.41 p.m. in intense, almost overpowering cold.

Below cloud base we found a beautiful scree run and descended over 1000 ft. in less than five minutes. Down to 2000 ft. the goal was in sight—we were going to break the record by six hours, barring accidents. Hopping, jumping, swearing and running down and down we reached the grass slopes and plunged straight through bog, marsh and a small river. We were down at exactly 4.30 p.m. We had broken the record by 6 hours 8 minutes!

A Day with the Pathans

By J. R. Graham

Drawings by Bruce Petty

THE North West Frontier of Pakistan is a barren, rugged country with a strange fascination. In the towns and plains the law of the land holds good. But if, on going through the Khyber Pass, you step only a few yards off the main road, you are in territory where the power of the local tribal Maliks, or chieftains, continues supreme. These gentlemen—I use the word advisedly—and their "subjects" can only be compared with the Scottish clans of old.

These frontier Pathans live in circumstances where survival itself is a full-time problem. To force a living from the bleak hillside is difficult if not impossible, and it is little wonder that from time immemorial they have turned to their inherent ability as fighters to supplement the frugality of nature. When there was no "official" war, they would seek plunder and an outlet for their aggressive spirits, either by raiding the villages and towns on the plains or by conducting inter-tribal feuds.

This same spirit exists today, with the result that practically every able-bodied tribesman carries a rifle or revolver wherever he goes. As there is no game to shoot, these can hardly be for sporting purposes, and in the absence of a general war they are not required for the defence of the realm. The Pakistan army and air force combine to make plunderings on the plains a most unhealthy occupation, so one can only conclude that between the tribes peace does not always reign supreme.

My first opportunity of meeting these agile warriors with their flashing eyes and gleaming teeth came in 1948, only a year after their favourite targets for many a decade—the British Army—had withdrawn from the country. That I was able to visit two tribal strongholds, several miles apart and both some miles off the main road, was only possible through the good offices of Pathan friends in Peshawar. The hospitality and friendliness with which I, the only European in our party, was received was quite overwhelming, and all added to the impression that I might have been in a Scottish glen four hundred years ago. The Pathan, like the clansman, has a boundless sense of responsibility for the well-being and protection of his guests.

The tribal strongholds themselves might have come straight from the pages of P. C. Wren—miniature forts commanding the neighbouring countryside from the hillocks on which they are built, their light-coloured and turreted clay walls glistening in the sun. Tea was the preliminary item on the agenda at our first port of call. It was served on low tables set out in the courtyard of the fort.

During tea a new revolver brought by one of my friends attracted much attention and was given a good airing by various people taking pot shots at the turrets on top of the walls; the reports of the shots and whines of the bullets made very appropriate background music! This, however, was only a prelude. The meal over, my host suggested that I too might care for a bit of shooting. Not knowing what to expect I took the easy way out, said "yes," and in next to no time half a dozen first-class ·303 rifles were produced. It would have needed a far greater expert than I to tell if these had been "ex-ed" from the army, legally or otherwise, or if they were some of the beautiful copies made locally.

The "shoot" consisted of firing at a small stone on the hillside over the valley from the fort. My host and some of his friends performed first, shooting from a squatting position which enabled them to keep well out of the thick dust. Although none hit the target, most were close enough for

me to be glad that I was shooting with them and not being shot at as would have been the case only a matter of months before.

When it was my turn to shoot I decided that, as squatting would almost certainly have involved the ignominy of being rolled down the hillside by the shock of the recoil, I would have to sacrifice clean clothes for prestige and shoot prone in standard Western manner. By the grace of goodness knows what, one shot winged the target, so our departure was made with colours flying high.

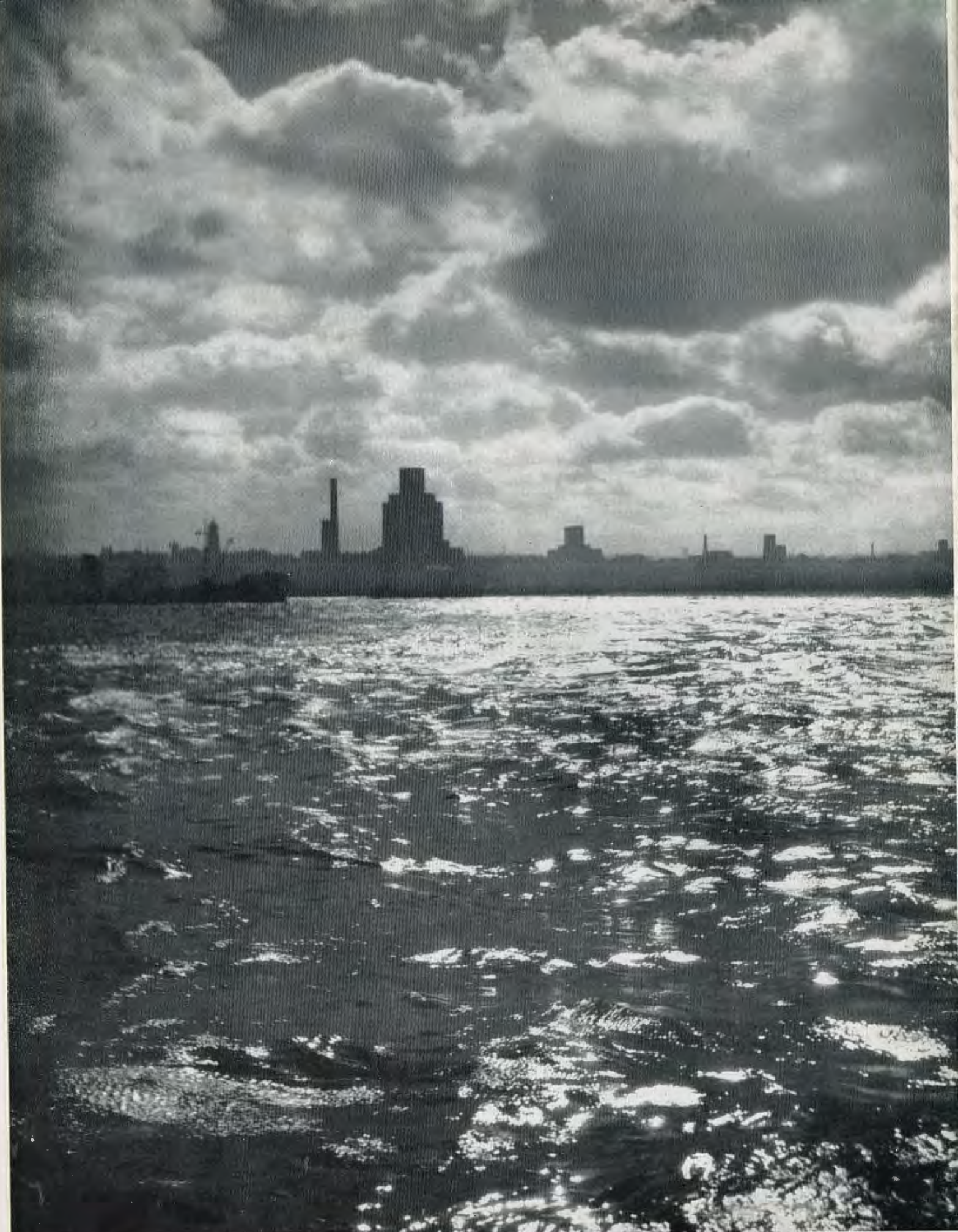
A fully fledged meal, with whole chickens, vast plates of rice and heaven knows what else, was laid on at the next stronghold. This was even more remote than the first; it was built on a much higher hillock accessible only by a steep path, and the last few miles of the road to it consisted of the very bumpy bed of a dried-up river. We again ate in the courtyard, but this time squatting on the ground and without the aid of any device such as a knife or fork: the only weapons in sight were the inevitable firearms, and even the young man pouring the water wore a bandolier and revolver.

With cramp in my legs and more rice going down my sleeve than into my mouth there was little time for an interpreter-conducted conversation until the meal was over. We were then shown one of the proud possessions of the Malik—a cannon located in a corner of the "battlements." It was a heavy cast iron affair kept in excellent order, but a demonstration was not possible as the breech block was in Peshawar for repair. As the gun was aimed right down the road up which we had come—and had to return!—I was not sorry that it was unserviceable.

As we were about to depart I noticed an opening about three feet square in the floor of the compound. It obviously indicated a very deep hole, and in my innocence I asked the Malik if it was a well. To say that I was impressed by his casual "Oh no, that is where we keep our prisoners" is to understate. Happily my non-prisoner status was then emphasised by being presented with a tribal *roti*. This high honour, which looks like a large pancake about two feet in diameter and a couple of inches thick, is made of unleavened bread. So far as I know, one of the few greater honours is the gift of a live goat—pity the visiting main board director!

My final memory that day of these great people was standing by the station wagon in the evening sun discussing with the Malik's son, who spoke some English, the effect of the proposed hydro-electric scheme on life in these arid and remote parts. This peaceful and urbane conversation was brought to a close by the Malik himself politely insisting that the journey back should start without delay, as once it was dark he could not guarantee our safety up to the main road, even although our way was all in his territory.

If ever the centuries were all mixed up in one small area, this was surely it.



Mersey Skyline

Photo by A. W. Caunt (Billingham Division)